

In the Specification:

On page 3, line 10, please amend the paragraph as follows:

Thus, in view of the above-noted conventional problems, and on the precondition that at least two optical pickups are provided for recording or reproducing optical disks such as CD (Compact Disc) and DVD (Digital Versatile Disk), it is an object of the present invention to provide an optical disk drive device that is capable of adjusting the position for detecting the amount of tilt in the radial direction of the optical disk with respect to the position for recording or reproduction while detecting the amount of tilt at the same time as recording or reproducing the optical disk, and to provide a method for correcting the tilt of the optical pickup.

On page 12, line 13, please amend the paragraph as follows:

Furthermore, the present embodiment is not limited to the combination of CD and DVD optical disks, but may also include alternate combinations. For example, a combination of DVD and an optical disk that uses blue laser light (BD (Blu-ray disc)) may be considered. This ~~Blu-ray disc~~ BD is a new generation optical disk in which the recording density is even higher than DVD, and it is necessary to adjust the tilt of the laser light axis from the ~~Blu-ray disc~~ BD optical pickup during recording or reproduction. Thus, in the case of the combination of a DVD and a ~~Blu-ray disc~~ BD, the tilt of both the DVD optical pickup 12 and the ~~Blu-ray disc~~ BD optical pickup is adjusted. That is to say, the tilt of the DVD optical pickup 12 and the ~~Blu-ray disc~~ BD optical pickup is adjusted by two types of tilt correction methods.

On page 12, line 24, please amend the paragraph as follows:

In order to adjust the tilt of the laser light axis from the ~~Blu-ray disc~~ BD optical pickup, it is also possible to use the sub-chassis 24 and the height adjustment mechanism 25, for example, in the same way as the DVD optical pickup 12.

Furthermore, it is also possible to correct the amount of tilt by applying a mechanism for changing the tilt of the objective lens of the ~~Blu-ray-dise~~ BD optical pickup through which the laser light passes (for example, an actuator for driving only the objective lens) and causing the laser light to be perpendicularly incident on the recording surface of the optical disk by changing the tilt of the objective lens. Even for the DVD optical pickup 12, it is possible to apply a mechanism for changing the tilt of the objective lens instead of the sub-chassis 24 and the height adjustment mechanism 25, for example. Correction of the tilt of the objective lens may be performed with an actuator, and this is a technique that is standard practice in DVD reproduction apparatuses. Moreover, the amount of tilt can also be corrected by alternative well known methods.

On page 13, line 9, please amend the paragraph as follows:

Furthermore, the tilt sensor 23 is provided on either one of the DVD optical pickup 12 or the ~~Blu-ray-dise~~ BD optical pickup. For example, the tilt sensor 23 is provided on the DVD optical pickup 12. In this case, when recording or reproducing a ~~Blu-ray-dise~~ BD, the DVD optical pickup 12 and the ~~Blu-ray-dise~~ BD optical pickup are moved while reading in the recording or reproduction position of the optical disk with the ~~Blu-ray-dise~~ BD optical pickup, the amount of tilt of the optical disk 16 at this radial position is detected by the tilt sensor 23 of the DVD optical pickup 12, and the direction of the laser light axis from the ~~Blu-ray-dise~~ BD optical pickup is adjusted in accordance with the amount of tilt that is detected to correct the tilt. Furthermore, when recording or reproducing a DVD optical disk, the DVD optical pickup 12 is moved while detecting the amount of tilt of the optical disk 16 from the tilt sensor 23 of the DVD optical pickup 12, and the direction of the laser light axis from the DVD optical pickup 12 is adjusted in accordance with the amount of tilt that is detected to correct the tilt.

On page 14, line 2, please amend the paragraph as follows:

Furthermore, for both DVD and ~~Blu-ray disc~~ BD, a long time is necessary to initially set the laser power, for example, of the optical pickup that is performed before commencing recording or reproduction. Thus, during the initial setting of the laser power, for example, of an optical pickup that has no tilt sensor 23, as noted above, it is desirable to move the other optical pickup to detect the amount of tilt with the tilt sensor, and to record in a memory the characteristics of the amount of tilt with respect to the position of the radial direction of the optical disk.

Lastly, the combination of optical disks should not be limited to CD and DVD or DVD and BD as mentioned above, but can be set optionally. For example, the present invention may be arranged for HD DVD (High Definition DVD) instead of DVD.

On page 14, line 15, please amend the paragraph as follows:

An optical disk drive device 10A of the present embodiment is a device that can handle DVD and ~~Blu-ray disc~~ BD, and is provided with the DVD optical pickup 12 and a ~~Blu-ray disc~~ BD optical pickup 31.

On page 14, line 18, please amend the paragraph as follows:

In a similar manner to the DVD optical pickup 12, the ~~Blu-ray disc~~ BD optical pickup 31 is supported such that it is movable in the radial direction of the optical disk by a guide shaft 33 that is provided on the upper surface of a sub-chassis 32, and is movable along the guide shaft 33 by a carrying mechanism 34. One end of the sub-chassis 32 is linked to the main chassis 14 by a shaft 32a, the other end is supported by a supporting member 38 such that the sub-chassis 32 is capable of vertical movement with respect to the main chassis 14, and this other end is elevated by a height adjustment mechanism 35 to adjust the tilt. Thus the tilt of the guide shaft 33 and the ~~Blu-ray disc~~ BD optical pickup 31 is adjusted, and the amount of tilt of the optical disk 16 is corrected.

On page 14, line 29, please amend the paragraph as follows:

Tilt sensors 36 and 27 are respectively mounted on the DVD optical pickup 12 and the ~~Blu-ray-disk~~ BD optical pickup 31. The tilt sensors 36 and 37 are well known technology (for example KU168 (trade name) from Stanley Electric Co. Ltd). After mounting the tilt sensors 36 and 37, a standard disk that has no curvature or warp is loaded onto the turntable 15, the adjustment heights of the height adjustment mechanisms 25 and 35 at which the recording or reproduction characteristics are optimal are determined while changing the tilt of the tilt sensors 36 and 37. The amount of tilt shown by the respective outputs of the tilt sensors 36 and 37 at this time is taken to be the standard amount of tilt (zero tilt), these standard amounts of tilt are associated with the adjustment heights of the height adjustment mechanisms 25 and 35, and are stored in a memory (not illustrated). Furthermore, the tilt sensitivity (output per unit of tilt amount) is determined based on sensitivity measurement data of the tilt sensors 36 and 37 obtained before they were mounted, and this tilt sensitivity is also stored in the memory.

On page 15, line 15, please amend the paragraph as follows:

In the optical disk drive device 10A, if the optical disk 16 is a DVD, then recording or reproduction of the optical disk 16 is performed while moving the DVD optical pickup 12, reading in the positional information from the optical disk 16 that shows the position in the radial direction of the optical disk 16, and sending this positional information to the tilt controller 28. The tilt controller 28 controls the carrying mechanism 34 to move the ~~Blu-ray-disk~~ BD optical pickup 31 and moves the detection position of the tilt sensor 37 to the position in the radial direction of the optical disk 16 that is indicated by the positional information. Thus, the detection position of the tilt sensor 37 always coincides with the recording or reproduction position of the DVD optical pickup 12.

On page 16, line 10, please amend the paragraph as follows:

If the optical disk 16 is a ~~Blu-ray-dise~~ BD, then recording or reproduction of the optical disk 16 is performed while moving the ~~Blu-ray-dise~~ BD optical pickup 31, the positional information indicating the position in the radial direction of the optical disk 16 is read in from the optical disk 16, and this positional information is sent to the tilt controller 28. The tilt controller 28 controls the carrying mechanism 27 to move the DVD optical pickup 12, and moves the detection position of the tilt sensor 36 to the position in the radial direction of the optical disk 16 indicated by the positional information. In this way, the positional information of the tilt sensor 36 always coincides with the recording or reproduction position of the ~~Blu-ray-dise~~ BD optical pickup 31.

On page 16, line 21, please amend the paragraph as follows:

The tilt sensor 36 detects the amount of tilt of the optical disk 16 at the recording or reproduction position of the ~~Blu-ray-dise~~ BD optical pickup 31. The tilt controller 28 determines a target adjustment height such that the amount of tilt that is detected is the standard amount of tilt, in accordance with the amount of tilt that is detected by the tilt sensor 36, the standard amount of tilt that is in the aforementioned memory (zero tilt), the adjustment height of the height adjustment mechanism 35 corresponding to the standard amount of tilt, and the tilt sensitivity of the tilt sensor 36. The adjustment height of the height adjustment mechanism 35 is set to the standard adjustment height by drive controlling the height adjustment mechanism 35. In this way, the laser light from the ~~Blu-ray-dise~~ BD optical pickup 31 is set so as to be perpendicularly incident on the recording surface of the optical disk 16 since the tilt of the ~~Blu-ray-dise~~ BD optical pickup 31 is altered and the amount of tilt of the optical disk 16 is corrected.

On page 17, line 5, please amend the paragraph as follows:

Moreover, if the DVD optical disk is contained in a cartridge, then the space between the optical disk and the tilt sensor 37 mounted on the ~~Blu-ray-dise~~ BD optical pickup 31 is blocked by the cartridge, for example, and detection of the amount of tilt by the tilt sensor 37 is impossible. In this case, the amount of tilt of the optical disk 16 is detected by the tilt sensor 36 mounted on the DVD optical pickup 12 while the optical disk 16 is recorded or reproduced by the DVD optical pickup 12, and the height adjustment mechanism 25 is drive controlled by the tilt controller 28 to adjust the tilt of the DVD optical disk pickup 12 in accordance with the amount of tilt detected by the tilt sensor 36. In this way, the laser light from the DVD optical pickup 12 is set so as to be perpendicularly incident on the recording surface of the optical disk 16 since the tilt of the DVD optical pickup 12 is altered and the amount of tilt of the optical disk 16 is corrected.

On page 17, line 18, please amend the paragraph as follows:

Furthermore, if the ~~Blu-ray-dise~~ BD is contained in a cartridge, then the space between the optical disk and the tilt sensor 36 mounted on the DVD optical pickup 12 is blocked by the cartridge, for example, and detection of the amount of tilt by the tilt sensor 36 is impossible. In this case, the amount of tilt of the optical disk 16 is detected by the tilt sensor 37 mounted on the ~~Blu-ray-dise~~ BD optical pickup 31 while the optical disk 16 is recorded or reproduced by the Blu-ray optical pickup 31, and the height adjustment mechanism 35 is drive controlled by the tilt controller 28 to adjust the tilt of the ~~Blu-ray-dise~~ BD optical disk pickup 31 in accordance with the amount of tilt detected by the tilt sensor 37. In this way, the laser light from the ~~Blu-ray-dise~~ BD optical pickup 31 is set so as to be perpendicularly incident on the recording surface of the optical disk 16 since the tilt of the ~~Blu-ray-dise~~ BD optical pickup 31 is altered and the amount of tilt of the optical disk 16 is corrected.

On page 18, line 2, please amend the paragraph as follows:

In such an optical disk drive device 10A of the present embodiment, even when recording or reproducing with either one of the DVD optical pickup 12 or the ~~Blu-ray~~ BD optical pickup 31, the tilt sensors 36 and 37 can be selectively used, and the amount of tilt can be corrected regardless of whether or not the optical disk 16 is contained in a cartridge.

On page 18, line 7, please amend the paragraph as follows:

It should be noted that in the case in which the optical disk 16 is not contained in a cartridge, and in which the optical disk 16 is recorded or reproduced by the DVD optical pickup 12 in parallel with detection by the tilt sensor 37, or is recorded or reproduced by the ~~Blu-ray~~ BD optical pickup 31 in parallel with detection by the tilt sensor 36, by detecting the amount of tilt of the optical disk 16 at an appropriate position that is further ahead of the recording or reproduction position of the optical disk 16, it is also possible to cancel the time lag from the detection of the amount of tilt to the adjustment of the tilt of the laser light axis from the optical pickup.